TCE-402 **1082**

Even Semester Examination 2018-19

B.Tech. (Civil Engineering) (SEMESTER-IV)

STRUCTURAL ANALYSIS-I

Time: 03:00 Hours **Max Marks : 100**

Note: **All** questions are **compulsory**. Draw diagrams wherever necessary. **All** questions **carry equal** marks. .

1. Attempt any **four** parts of the following : [5×4=20]

   (A) Give a Detailed Classification of Structures with neat sketches.

   (B) Define the degree of static indeterminacy and degree of kinematic indeterminacy for the structures.

   (C) State and prove the muller-breslau's pronciples.

   (D) Determine the deflection at the free end of a cantilever when a load W is applied at a distance 'a' from the free end. Use conjugate beam method

   (E) Define an arch. How an arch is differs from beam?

   (F) State and prove the Betti's Law.

2. Attempt any **four** parts of the following : [5×4=20]

   (A) State and prove the cable theorem.

   (B) Derive an expression for the change in a suspension cable due to temperature stress.

   (C) State and prove the castigliano's first theorem.

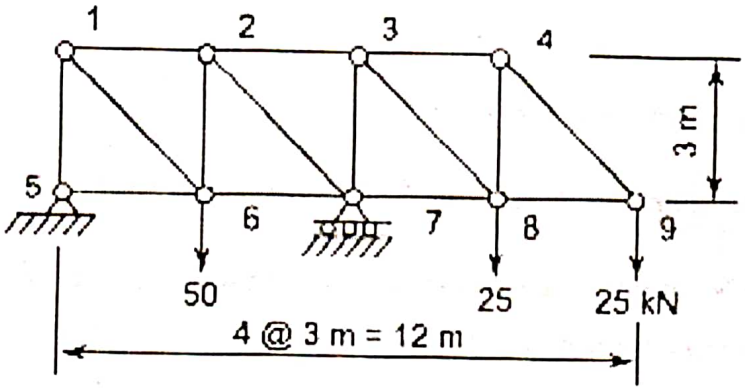
(D) State the Eddy's theorem and prove it

(E) What is strain energy? Derive the expression for strain energy of a straight prismatic bar of length L and cross-sectional area A, if it is subjected to an axial load F.

(F) Define the influence line diagram.

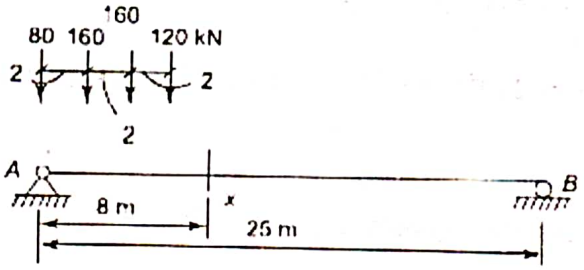
3. Attempt any **two** parts of the following : [10×2=20]

(A) Use the method of joint to analyse the truss as shown in fig below



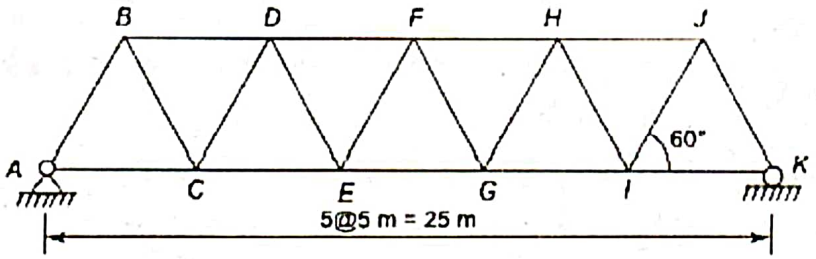
(B) A suspension cable with 50 m span and 4 m dip is stiffened by a three-hinged girder. The dead load of the girder and the deck is 7.5 kN/m. Find S.F. and B.M. in the girder at a section 10 m from left hand hinge when a concentrated load of 100 kN is placed at 8 m from the left end. Find the maximum tension in the cable.

(C) The load system shown in Fig. below crosses a girder 25 m span with the 120 kN load leading. Determine the value of (i) Maximum B.M. at a section 8 m from the left end of the girder and (ii) Absolute maximum B.M. on the girder.

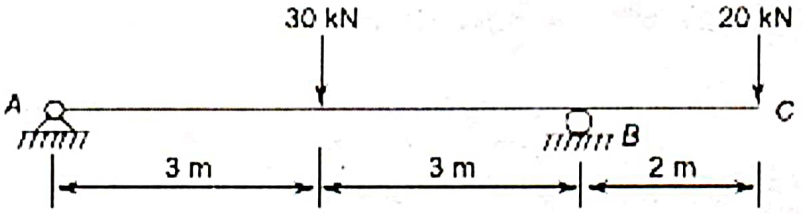


4. Attempt any **two** parts of the following : [10×2=20]

(A) It is required to determine the maximum forces in members CE, DE and DF of the truss as shown below due to a dead load of 10 kN/m covering the entire span and a moving load of 20 kN/m longer than the span passing over the truss. Consider that the loads are transmitted through the lower chord.



(B) An overhanging beam has the dimensions and loading as shown in Fig. below Using the conjugate beam method, find the slopes at A and B, and deflection at point C. EI is constant.



(C) A parabolic arch having a constant arch rib has a span 64 m, and rise 12.8 m, and is hinged at the two supports. Two concentrated loads, each 20 kN, are acting at 8 m and 16 m from the centre measured horizontally on the left half of span. Determine horizontal thrust at the supports.

5. Attempt any **two** parts of the following : [10×2=20]

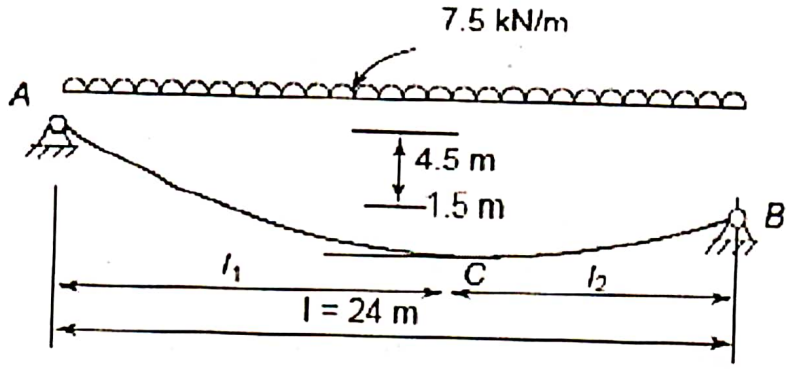
(A) A three-hinged parabolic arch has span 16 m and central rise 4 m. It carries a concentrated load of 100 kN at 4 m from left support. Evaluate reaction components, moment, thrust and radial shear at a section 6 m from left support. Take the equation of the arch $y = 4\ h\ x\ (l - x)$ with left-hand support as origin. Draw bending moment diagram.

(B) A cable is suspended and loaded as shown in Fig. below

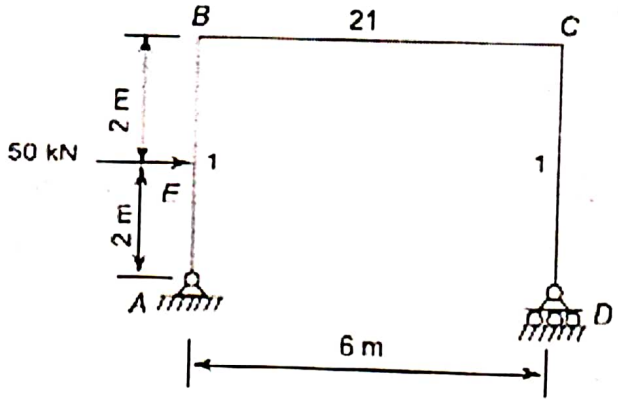
(a) Compute the length of the cable.

(b) Compute the horizontal component of tension H, in the cable.

(c) Determine the magnitude and the position of maximum tension in the cable.



(C) The horizontal displacement at support D is to be determined for the frame shown in below figure. Relative I values are indicated along the members. E = 200,000 MPa,I = 300 x 10^6 mm^4.



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